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ABSTRACT

A computer-assisted instructional (CAI) program jointly sponsored by the English and Computer Science Departments at Red Deer College is being used to examine the ability of the computer to drill students in spelling. The program, called SPELLINGCLUES, runs in FORTRAN IV on an IBM 360/67 computer and covers a list of 100 frequently misspelled words. Students are asked, via audiotapes, to spell the words; the accompanying dialogue responds to both correct and incorrect answers, analyzes errors, provides examples of usage, and reminds students of appropriate spelling rules. Students control the sequence and pace of their individual programs and work in an atmosphere of privacy and anonymity. Formal evaluation has not yet been conducted, but preliminary indications are that the program is successful. A revised edition is being prepared, which will be capable of more flexible diagnosis and which will be able to handle unexpected errors. In addition, more complex CAI programs are being planned to combine spelling drill with other aspects of written communication, such as punctuation and vocabulary usage. (PB)

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THE *SPELLINGCLUES* PROJECT AT RED DEER COLLEGE: DIALOGUE WITH THE COMPUTER AS AN APPROACH TOWARD IMPROVING ENGLISH SPELLING

The College or University level student who claims that "nobody else spells this word the same way I do" or who finds his written assignments virtually bleeding from an English instructor's well-meant but relentless indications of mechanical errors, has frequently had little choice but to resign himself to his deficiencies. Not only might he be faced with a real academic disadvantage for the duration of his period of study, but, upon graduation, he might also be left with a potential professional handicap. Since it stands to reason that, regardless of his profession, he may frequently be called upon to present written submissions, position papers, lengthy memoranda, and detailed reports, if his competence in the basic skills of written English has not developed by then, he could possibly find himself passed over at promotion time. While his period of study in College or University may well be the student's last chance to make up for any of these deficiencies before entering professional life, it is obvious that the inevitable demands of a heavy schedule of lectures, seminars, and labs make it almost impossible for the student to find the necessary extra hours required to work over dictionaries and mechanical exercises. Furthermore, most students and instructors would agree that classroom drill in the mechanical aspects of English would not only be an unrealistic

and impracticable venture at this level, but would also constitute a tedious and embarrassing prospect for the student. Even apart from the classroom, the most well-intentioned and conscientious instructor frequently finds it extremely difficult indeed to provide the specialized attention required by students experiencing difficulty in the basic skills of written English.

With these circumstances in mind, a joint venture in Computer-Assisted Instruction was undertaken at Red Deer College this year by members of the English Department and members of the Department of Computer Services*, in an experiment to determine whether the resources of the computer might be effectively utilized in enabling the busy student to perform needed drill in English mechanics efficiently, in a minimum period of time, and outside of regular lecture and lab hours. During the Fall of 1972, this project was begun by designing an experimental instructional Spelling Program (called *SPELLINGCLUES*) which would, it was hoped, be sufficiently flexible to meet the individual needs of students at this level. One hundred of what appeared to be the most frequently misspelled words in the English language were selected and divided into five separate series of twenty words each, arranged in a progressive order of difficulty. The learning strategy of the program was based upon the reasonable expectation that, in most cases, student misspellings would very likely correspond to certain predictable pitfalls. Accordingly, for each of the one hundred words in the Program, a separate list of anticipated spelling errors was assembled, based upon errors

* The group consisted of Lydia Bubba, Gary Botting, Jean Dawe, and Ralph Wold from English, and of Jon Thorhallsson and Faye MacDonald from Computer Services.

which English instructors found to recur most frequently in written assignments. Additionally, four sentence examples illustrating each word in different contextual uses were prepared, providing the student with the option of receiving up to four such illustrations of each word before attempting to spell it.

The next step consisted of devising an appropriate dialogue to accompany each anticipated spelling, such that the dialogue partner (to be played by the computer) could provide instantaneous responses to the student, informing him whether his spelling was accurate, or whether and in what manner his attempted spelling should be corrected. In order to avoid discouraging the student and also to mitigate the usual tediousness associated with drilling, the dialogue was designed so that a student who produced the correct spelling would receive an appropriate congratulatory response, while a student making an incorrect attempt would receive an encouraging (sometimes mildly humorous) hint as to where he was in error, and then would be given another chance at spelling the word. Thus, if a student should select the word

ARGUMENT

the dialogue partner would first ask him

DO YOU WANT AN EXAMPLE?

If the student's reply happened to be in the affirmative, the dialogue partner would respond with the following sentence example:

MOST PEOPLE WOULD AGREE WITH THE ..... FOR TAX REFORM.

Sentence examples, however, were intended to be entirely optional to the student, who was free to dispense with them as he chose and to proceed immediately with the spelling. In this case, if he should spell this word correctly, he would receive the following response:

THERE IS NO ARGUMENT. YOU ARE BRILLIANT!

If, on the other hand, the student's spelling should be

ARGUEMENT

the dialogue partner's response would be

OOPS! YOU HAVE AN EXTRA VOWEL IN THE MIDDLE OF THE WORD.

Rather than presenting students with an arbitrary set of spelling rules, or grouping sets of words according to spelling conventions, the approach was to guide the student progressively through words which have frequently been misspelled, and to encourage the student, at the same time, to locate and correct his own errors. However, if a student's error should result from his forgetting or neglecting to apply a particular rule of English spelling, the dialogue partner would respond by reminding him of that rule. Thus, if the target were

RECEIVE

and the student spelled it

RECIEVE

the dialogue partner would respond by advising the student to

REMEMBER THE RULE : "I" BEFORE "E" EXCEPT AFTER "C" ... ETC.

With the dialogue described above, designed in order that the student could communicate with the dialogue partner by means of a teletype terminal, the words to be spelled were pre-recorded on cassette tapes, with one series of twenty words per tape, to be operated by the students themselves at the terminal. The Program was designed to allow the student to take the five series of words in any order and to try the words within each series in the order of his choice. Thus, the student could concentrate upon the words with which he was experiencing difficulty, and might, if he wished, skip over those which he was already certain of spelling correctly. The Program permitted him a maximum of three attempts at spelling a word. If his difficulty persisted, the dialogue partner would then provide him with the correct spelling, ask him to memorize it, and direct him to re-type it correctly. Only after correcting his spelling could the student proceed to the next word of his choice in the series. However, in order to prevent a student from simply making a practice of obtaining from his dialogue partner the correct spellings of words and then re-typing them, a lock-out feature was devised whereby the student would be disallowed a second attempt at a previously-spelled word in the same session. Words which a student was finding difficult to master could always be reviewed at a later session at the terminal.

Within reasonable limits, therefore, and with only a minimum of necessary restrictions, the student was almost entirely in control of the sequence of content and the rate of progress of his sessions with

the Spelling Program. According to Professor Rosemary Newkirk of the Computer Science Department at the University of Western Ontario, the use of a learner control strategy, in which the student is required to play an active role in selecting the content of his lessons, is highly preferable, for the more mature and experienced learner, to the potentially frustrating machine controlled sequence which allows the student no opportunity to exert his own initiative. * In documenting the results of her study, Professor Newkirk noted that there was "a tendency . . . for students who had used the learner control strategy to respond more favourably than those who had used the machine control strategy; students who had used the learner control strategy rated their sequence significantly more interesting than the other students rated theirs." ** Taking Professor Newkirk's findings into consideration, then, the learning strategy of the Spelling Program was designed with the intention of providing the individual student with an optimum degree of control over his learning situation.

The dialogue described above was subsequently implemented by writing a software package in FORTRAN IV to control the dialogue between the student and the computer playing the role of the dialogue partner. The software package is written in standard FORTRAN IV, and can be implemented on any computer with an interactive FORTRAN IV compiler. Presently, Red Deer College is using the powers of an IBM 360/67 operating under MTS and located at the University of Alberta in Edmonton, Alberta.

* "A Comparison of Learner Control and Machine Control Strategies for Computer Assisted Instruction", Presented at the Canadian Information Processing Society's Conference, Vancouver, British Columbia, June, 1970.

** Op. Cit. p. 10.

In its present stage, the Spelling Program has been in use at Red Deer College and at Grant McEwan Community College in Edmonton for a period of only six months, and is presently in the process of being implemented at the University of Calgary and at the Southern Alberta Institute of Technology in Calgary, Alberta. At the present time, however, the Program is, admittedly, still very much in its experimental stages and has not been in use for a sufficient period of time to permit any extensive evaluation. Plans for the testing and statistical evaluation of the present stage of the Program will, however, be carried out within the next few months, and it is expected that this information will be available sometime early next year. Nonetheless, initial response from students seems to indicate that the most positive advantage of the Program lies in its combination of a completely individualized approach with an atmosphere of complete privacy and anonymity. Using this method, the student may work at spelling on his own time, outside of class hours, and still receive the specialized attention which he requires. He is allowed to progress at his own rate through the tapes, obtaining instant feedback on his degree of accuracy, and is assisted in correcting his own mistakes. Work partially completed at one session can be resumed at a later session, at the precise point at which the student stopped.

After each session at the terminal, the student's work was evaluated by his English instructor, who was then in an ideal position to offer personalized advice on whether the student should undertake further review or should proceed to a more advanced series. For this purpose, the advantage of using a hard copy device over a visual display

terminal was that the instructor could actually go over the student's entire session with him, make suggestions regarding each student's individual progress, and keep for his own records a hard copy of each of his students' sessions at the terminal. Combining an instructor's personalized approach in this way with the efficiency and precision of a computer thus makes it possible for the instructor to utilize the computer as a means of providing the student with a palatable and relatively painless method of drill outside the classroom, while at the same time availing himself of the opportunity of maintaining that personal contact with the student which is so essential at this level.

Even without the benefit of conclusive testing, English instructors have discovered a noticeable decrease in the number of spelling errors in the written assignments of students who have completed the Program, at least with respect to the one hundred words covered in the Program. It would appear, then, that this approach helps train the student's ability to recognize spelling errors. Instead of merely being given correct spellings, the student is first given direction in making his own corrections, and is thereby reminded of possibly forgotten spelling rules and typical pitfalls. As a result, students seem better able to retain the correct spelling of a word learned during a session with the computer.

Comments from students also indicated that the optional sentence examples helped them, in many cases, to achieve a clearer understanding of the contexts and meanings of words, and often made them generally more conscious of word usage. The implications of these reactions are, of course, very encouraging when one considers that, in

subsequent phases of the project, the goal will be to combine spelling drill with other aspects of written communication such as vocabulary, punctuation, etc. By developing and expanding the use of these sentence examples accompanying the words to be spelled, a student could be given the opportunity not only of improving his spelling, but also of developing simultaneously his vocabulary, his sensitivity to word usage, and his skill in punctuation. This goal could be achieved by expanding the basic sentence examples to progressively more lengthy units, so that a student might be able to drill, either simultaneously or separately as he chooses, in several aspects of written communication, including sentence structure, syntax, and grammar.

Within the frameword of these plans for the design of a more comprehensive approach, the Spelling Program, in its present stage, is in the process of undergoing considerable expansion and alteration. The second phase of the *SPELLINGCLUES* project, which is scheduled for implementation this Fall,will introduce a somewhat more flexible approach toward detecting and diagnosing each student's spelling problems. In its present stage, the Spelling Program Software enables the computer to recognize only correct spellings and a limited number of anticipated incorrect attempts on the part of the student. Thus, if the student's errors do not happen to conform to the common or predicted ones, he can only be asked to try again, without being given any directive as to where or to what extent he is off the track. An additional software module, presently being tested, will, in cases where the student's attempted spelling does not match any of the anticipated misspellings, perform an extensive analysis of the attempted

spelling to identify the correctly spelled fragments and to print these, separating them by a series of dots. Consequently, the student can concentrate on the incorrect fragments in his previous attempted spelling, as indicated by the dots. For this purpose, he can re-listen to the word on the audio tape, if he so wishes, before attempting to spell the word again. This approach, which consists of supplementing the list of common misspellings and associated corrective suggestions with a powerful analysing software, will, we hope, represent the optimum use of both the human and machine resources, while at the same time placing the program under almost complete student control for better retention of the achieved learning. * Successful implementation of this second phase of the *SPELLINGCLUES* project could, within a very few months, be combined with the introduction of the first phase of a Punctuation Program, thus enabling students to experiment with and react to a simultaneous approach toward improving both their Spelling and their Punctuation.

Although, as indicated earlier, the past few months of experimentation have not yet provided an adequate opportunity for obtaining conclusive results, they have given rise to considerable cause for optimism among students and English instructors who have participated in the project. By allowing the student to progress at his own rate, by permitting him to dispense with tedious and possibly embarrassing classroom drill, by enabling him to correct his own errors, and by making him generally more aware of word usage and typical spelling

* Among Professor Newkirk's findings was the fact that students using a learner control strategy have demonstrated a higher retention factor than those using a machine control strategy (Op. Cit., p. 10).

pitfalls, this instructional Program seems to have had at least a preliminary effect of decreasing, to a certain extent, the number of spelling errors in the student's written assignments. Meanwhile, the development of the more flexible approach whereby a student's attempted spelling will be analysed systematically by the computer software in order to determine the precise word fragment containing the error and in order to indicate to the student the position of the error, will, in all probability, provide more individualized assistance to a greater number of students in a far less rigid manner than has until recently been possible. As further stages are realized toward the development of a more comprehensive English Program, the instructor would, ideally, have greater opportunity to concentrate on the more complex problems of style, expression, and literary interpretation, and might thus be able to encourage a greater degree of creativity and enthusiasm among his students. It is to be hoped as well that the English student, in the not-too-distant future, might be provided with a combination of ideal situations -- a relatively painless and fully individualized means of performing necessary drill apart from the classroom, and a more stimulating rapport between instructors and students within the classroom. And if the bleeding English assignment does not in fact become entirely passé, it still might well become more the exception than the rule for the many students who had once thought that for them there was no solution.

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NOTE

More detailed information on the present phase of the *SPELLINGCLUES* Project, including the Program Listing and File Listings, has been published in the form of a Manual entitled Computer-Assisted Instruction Applied to English Spelling (Red Deer College, 1973), and is available upon request. Complimentary copies may be obtained by writing to the authors of this paper, c/o Red Deer College, Red Deer, Alberta, Canada.

APPENDIX

Sample Dialogue Between The Student And The Computer

Computer: MTS (LA50-0039)
WHO ARE YOU?
COLLEGE RDR
Student: #SIG ....
Computer: #PASSWORD?
Student: ....
Computer: #ON AT 12:56.50 ON MON MAR 19/73 LAST ON AT 12:40.02
Student: #RUN SPELLING 4=A 5=B
Computer: #12:57.17
HI THERE! WE ARE ABOUT TO BEGIN A PROGRAM WHICH WILL HELP YOU IN SPELLING THE MOST DIFFICULT WORDS IN THE ENGLISH LANGUAGE. WHICH SERIES DO YOU WISH TO TRY - 1, 2, 3, 4, OR 5? TYPE IN THE NUMBER.
Student: 4
Computer: WHEN YOU ARE READY TO STOP, TYPE 'STOP' AFTER THE 'READY FOR NUMBER' INSTRUCTION. WHAT NUMBER DO YOU WANT TO START AT? TYPE IN A NUMBER FROM 1 - 20.
READY FOR WORD NUMBER --.
Student: 19
Computer: DO YOU WANT AN EXAMPLE?
Student: YES
Computer: THE CHARACTER IS ..... SINCE THE WRITER MAKES HIM LIVE IN THE STORY.
DO YOU WANT AN EXAMPLE?
Student: NO
Computer: NOW YOU TRY IT.
Student: PLAUSIBLE
Computer: A BRILLIANT JOB! READY FOR WORD NUMBER --.
Student: 8
Computer: DO YOU WANT AN EXAMPLE?
Student: YES
Computer: RELIGIOUS POLEMICS IS THE STUDY OF ..... THEOLOGIES.
DO YOU WANT AN EXAMPLE?
Student: NO
Computer: NOW YOU TRY IT.
Student: CONTRAVERSIAL
Computer: CAREFUL - YOU HAVE A WRONG VOWEL AROUND THE MIDDLE OF THE WORD.
Student: CONTROVERCIAL
Computer: YOU HAVE A WRONG CONSONANT TOWARD THE END.
Student: CONTROVERSILE
Computer: SORRY ABOUT THAT. MAYBE YOU SHOULD MEMORIZE THE SPELLING.
RELIGIOUS POLEMICS IS THE STUDY OF CONTROVERSIAL THEOLOGIES.
NOW YOU TRY IT.
Student: CONTROVERSIAL

(The student proceeds through the series. If he wishes to stop before completing the series, he simply does the following:)

Computer: READY FOR WORD NUMBER --.
Student: STOP
Computer: STOP 0 #13:20.23 8.922 RC=0
Student: #SIG
Computer: #OFF AT 13:20.31 03-19-73